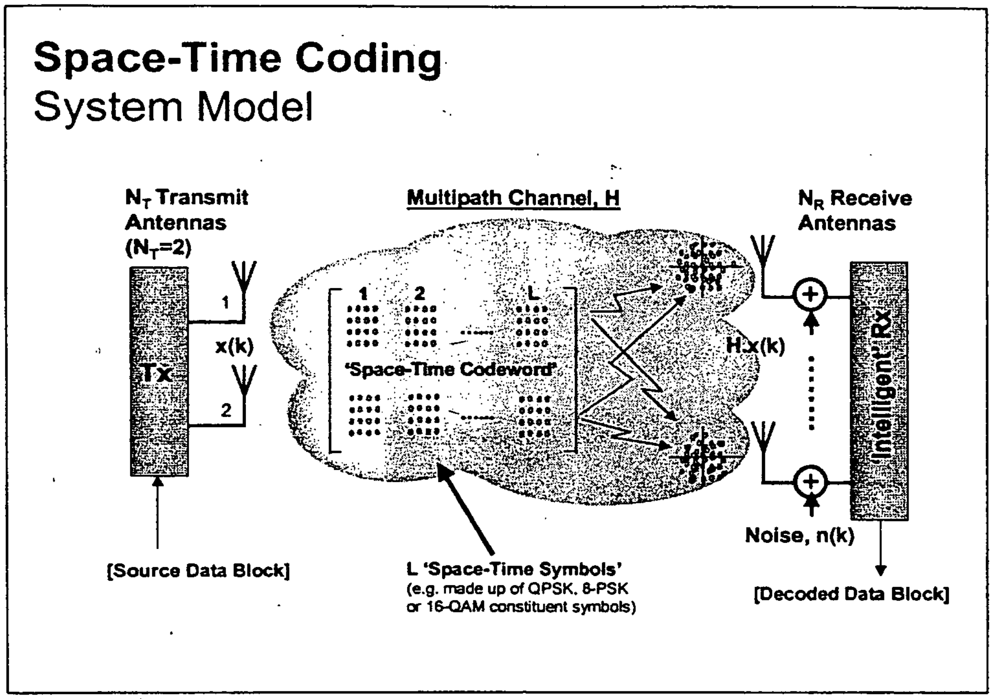


Figure 1

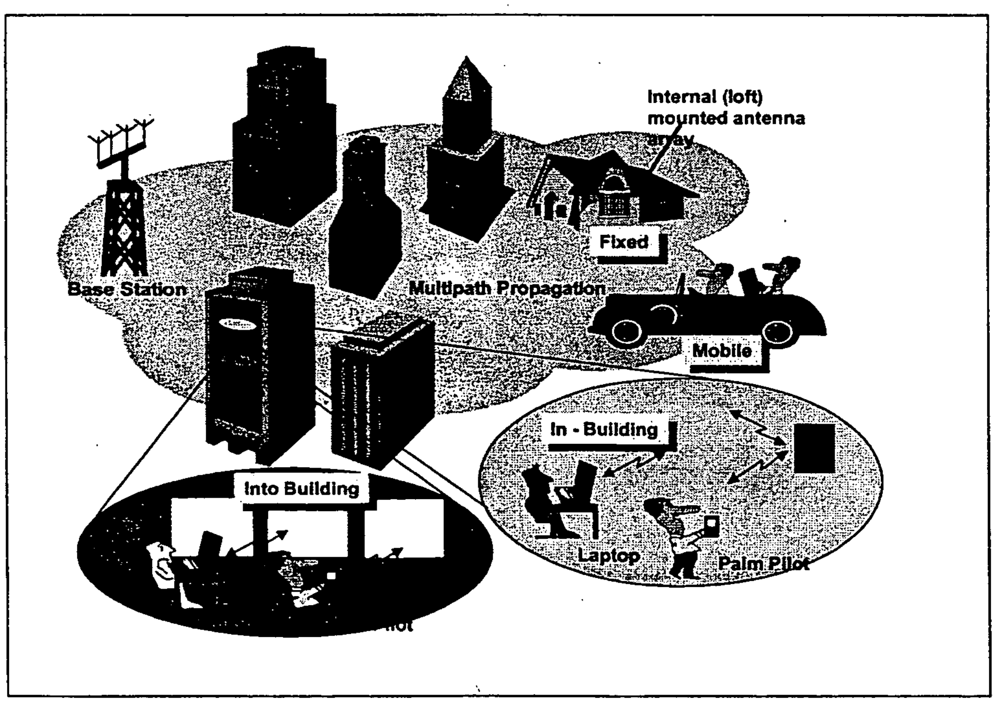


Figure 2

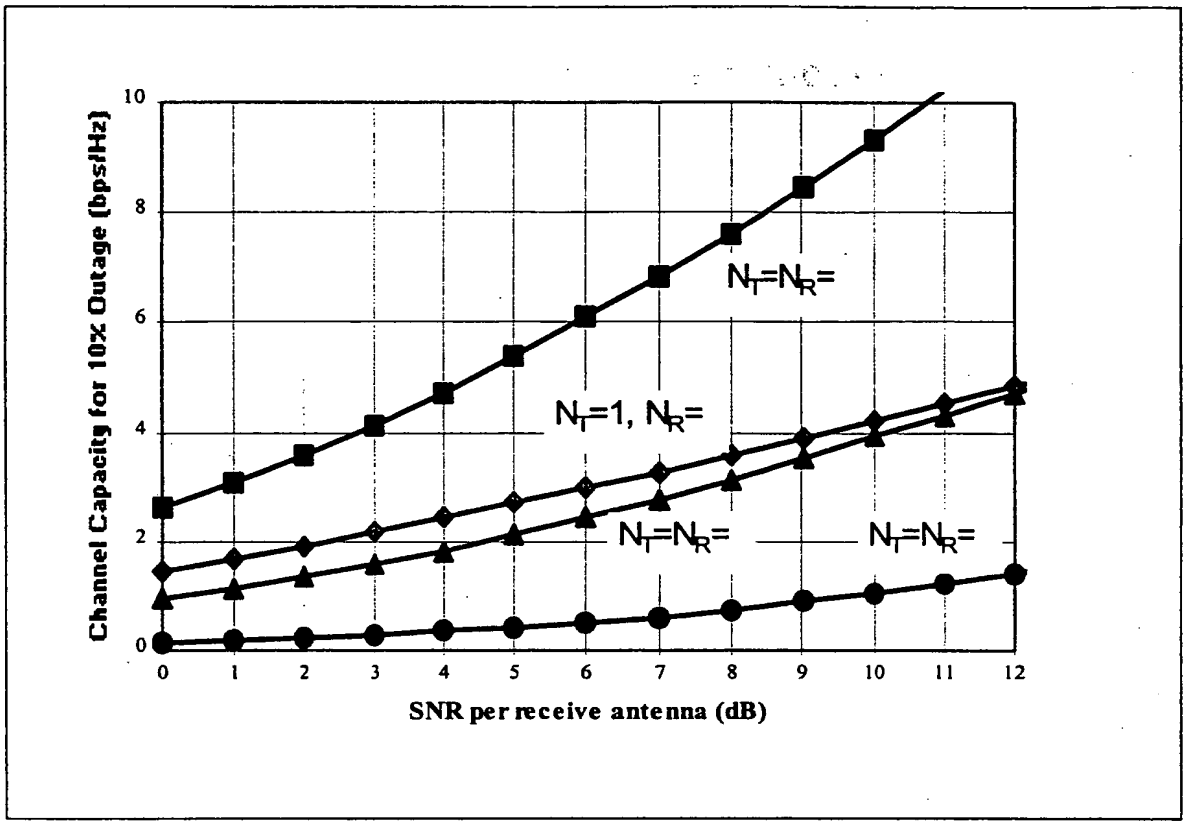


Figure 3

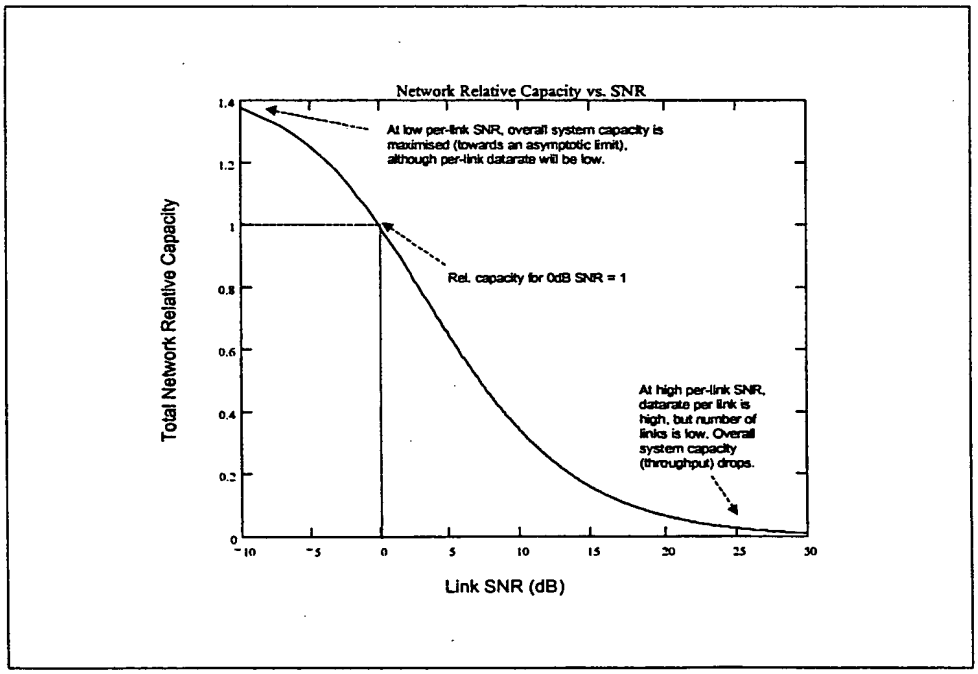


Figure 4

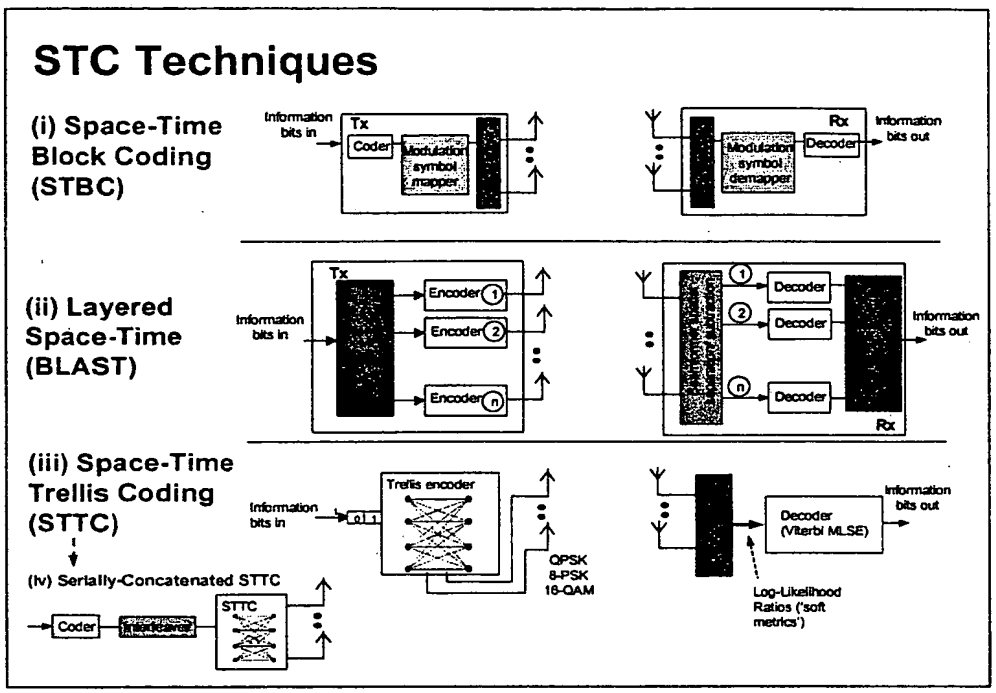


Figure 5

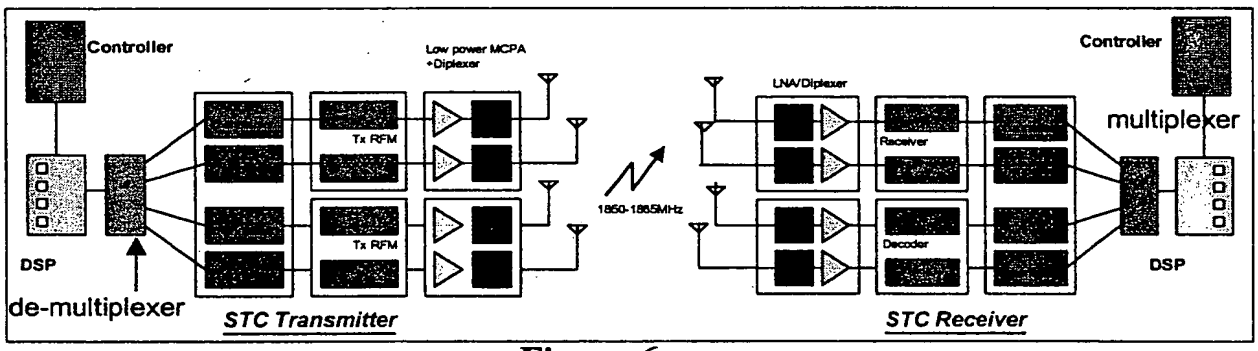


Figure 6

Figure 7

900

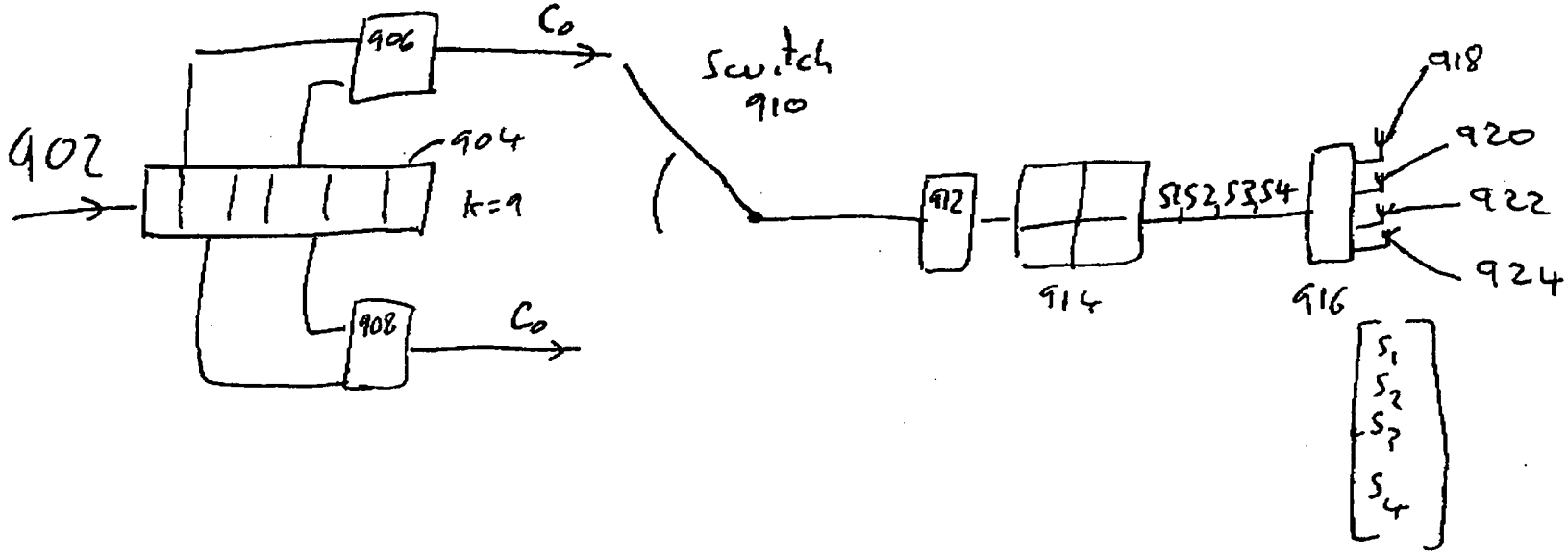
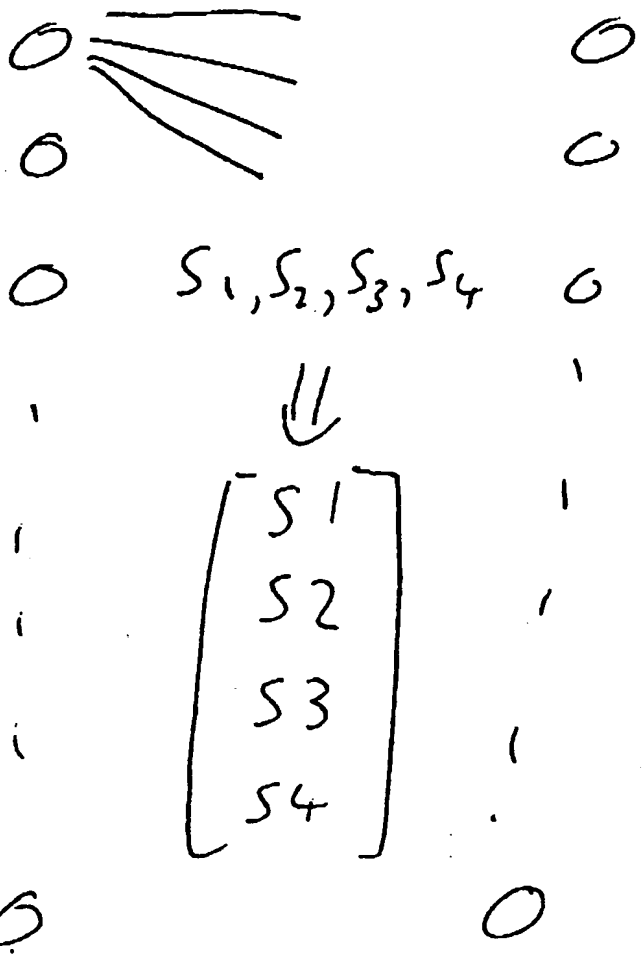

906
C_0
switch
910
902
904
k=9
908
C_0
912
914
$S_1 S_2 S_3 S_4$
916
918
920
922
924

Figure 8



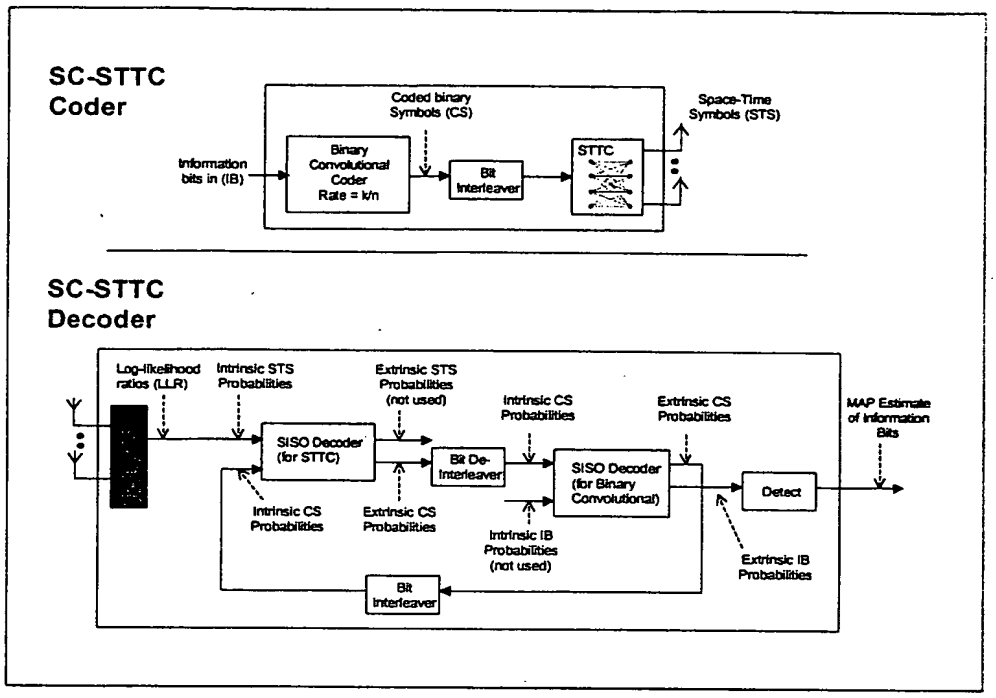


Figure 9

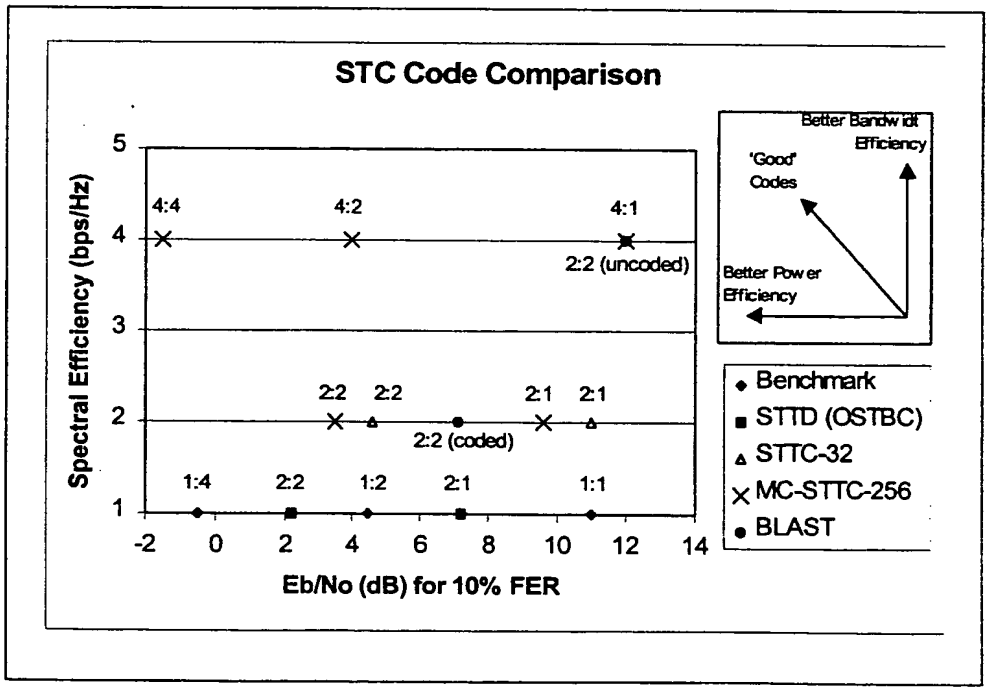


Figure 10

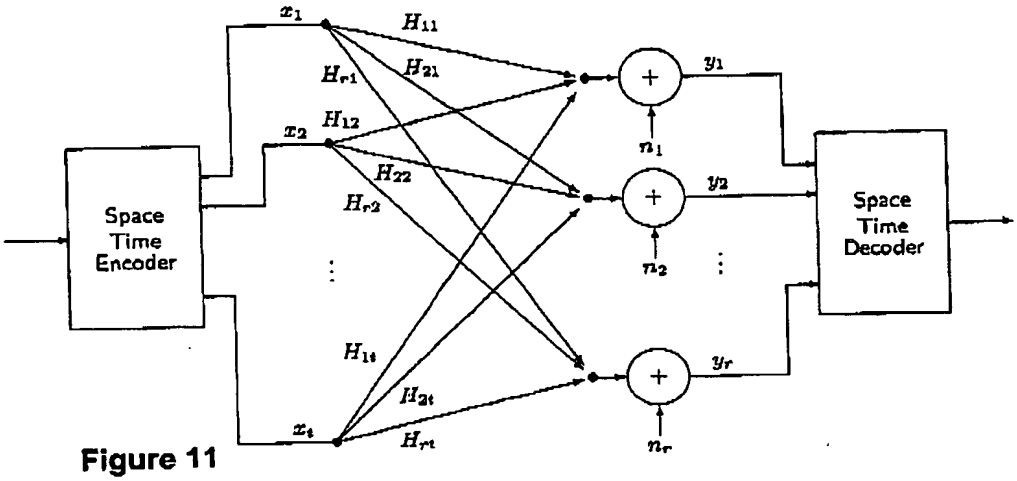


Figure 11

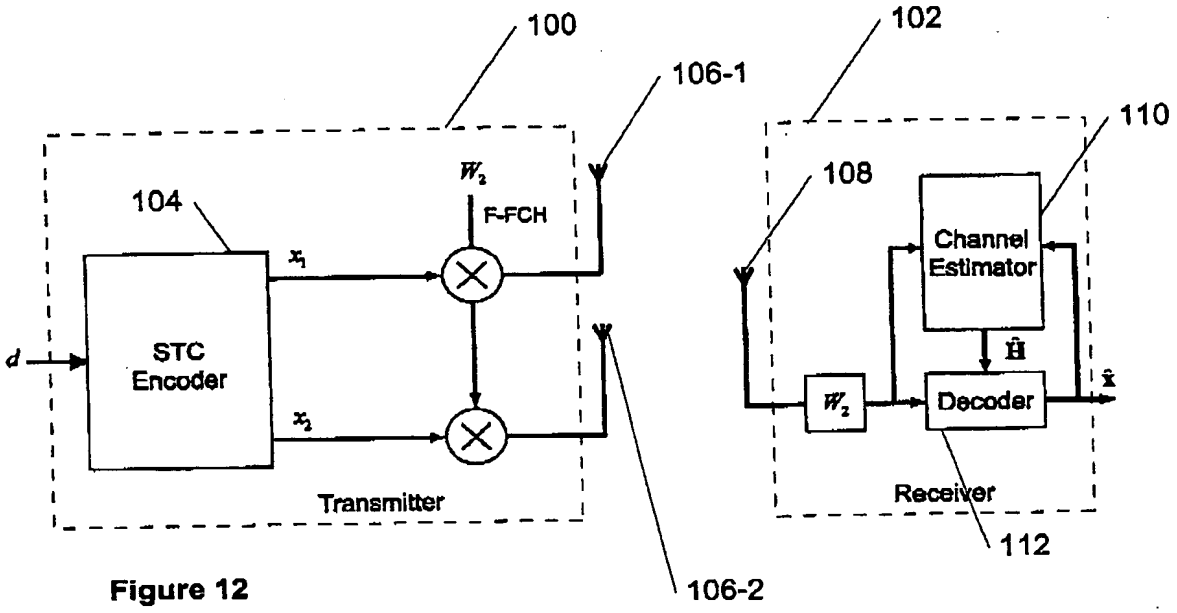


Figure 12

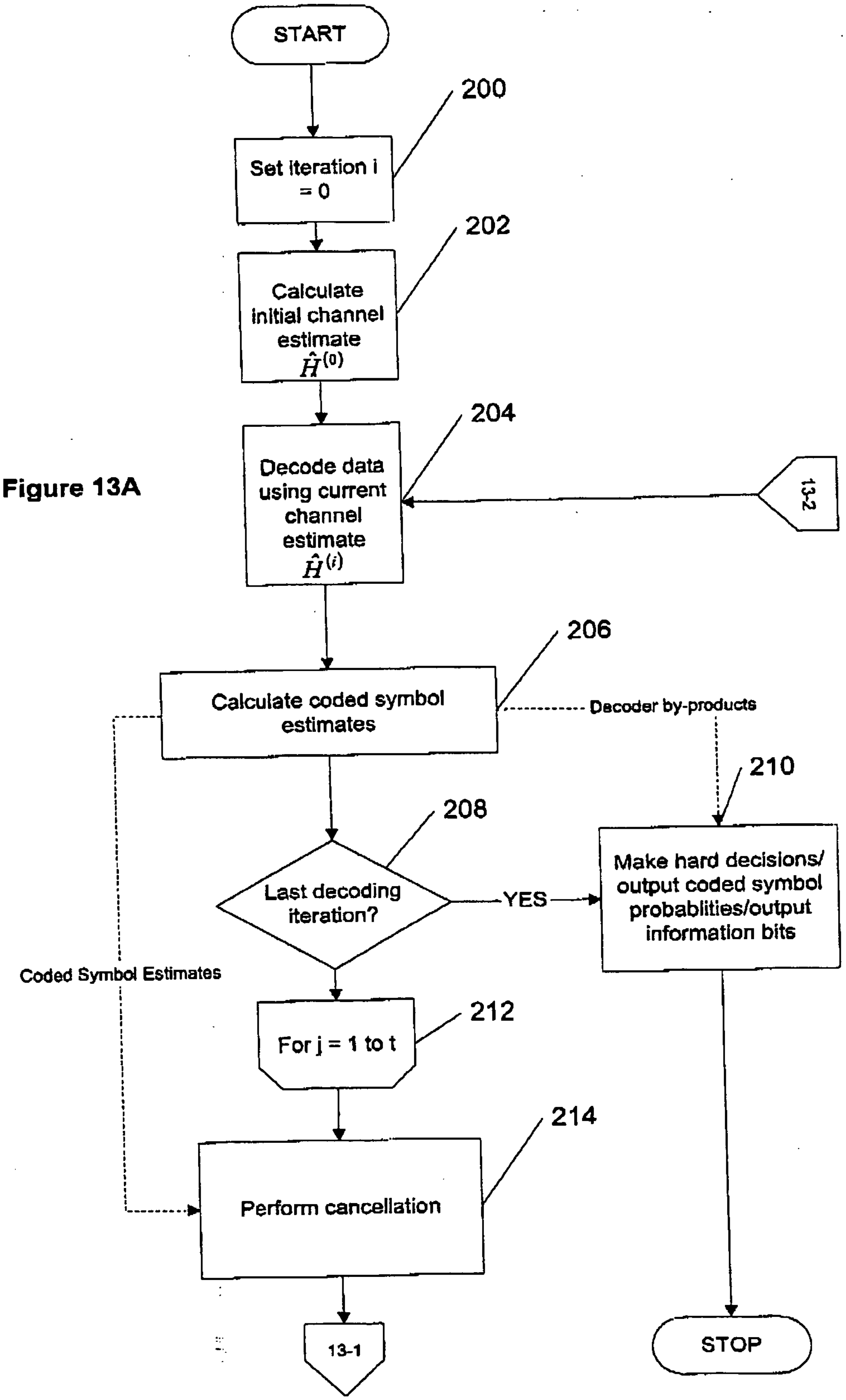
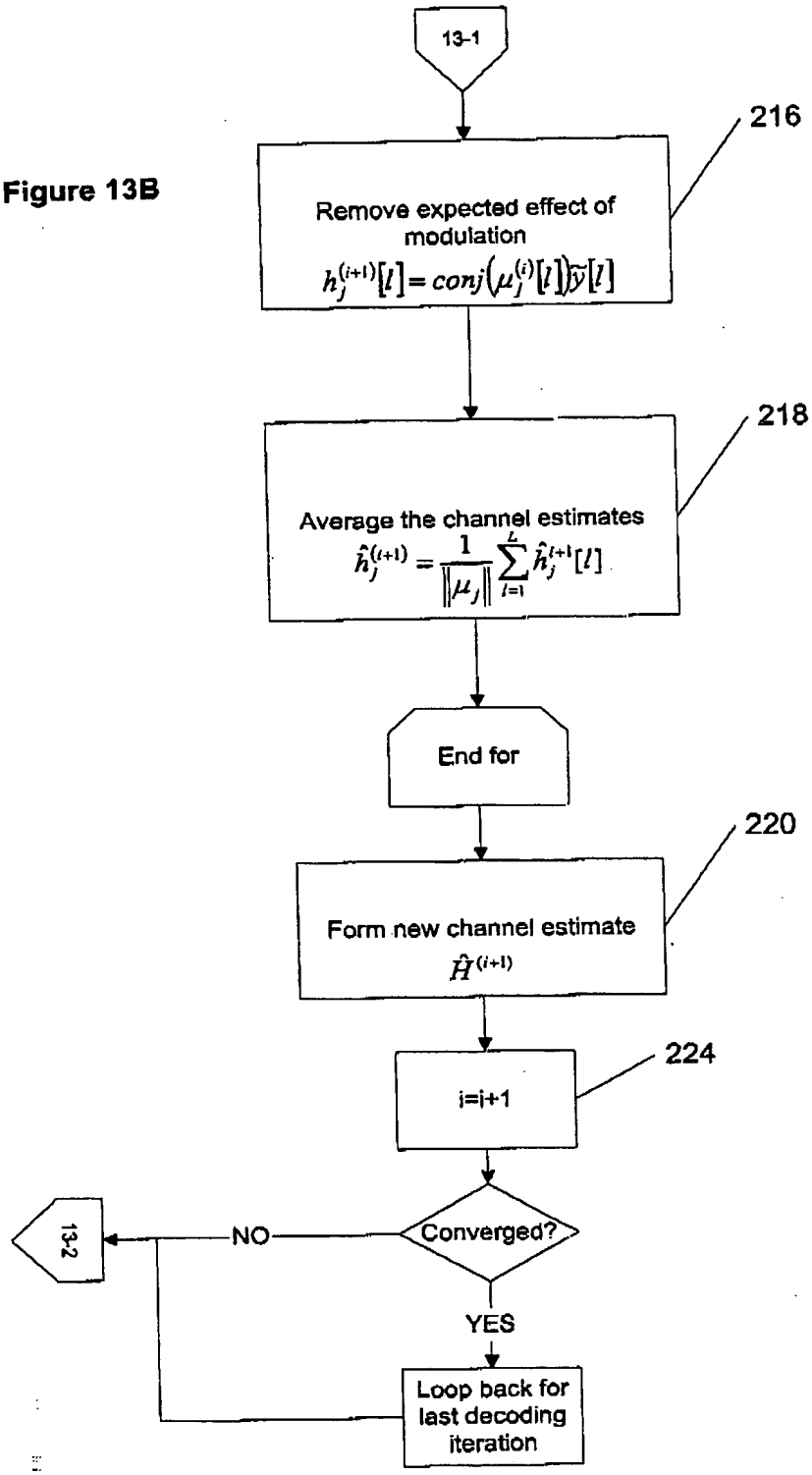

START
Set iteration i = 0
200
Calculate initial channel estimate $\hat{H}^{(0)}$
202
Decode data using current channel estimate $\hat{H}^{(i)}$
204
13-2
Calculate coded symbol estimates
206
Decoder by-products
210
Last decoding iteration?
208
YES
Make hard decisions/ output coded symbol probablities/output information bits
Coded Symbol Estimates
For j = 1 to t
212
Perform cancellation
214
13-1
STOP

Figure 13A

Figure 13B


13-1
216
Remove expected effect of modulation
$h_j^{(i+1)}[l] = conj\left(\mu_j^{(i)}[l]\right)\tilde{y}[l]$
218
Average the channel estimates
$\hat{h}_j^{(i+1)} = \frac{1}{\|\mu_j\|}\sum_{l=1}^{L}\hat{h}_j^{i+1}[l]$
End for
220
Form new channel estimate
$\hat{H}^{(i+1)}$
224
i=i+1
Converged?
NO
13-2
YES
Loop back for last decoding iteration

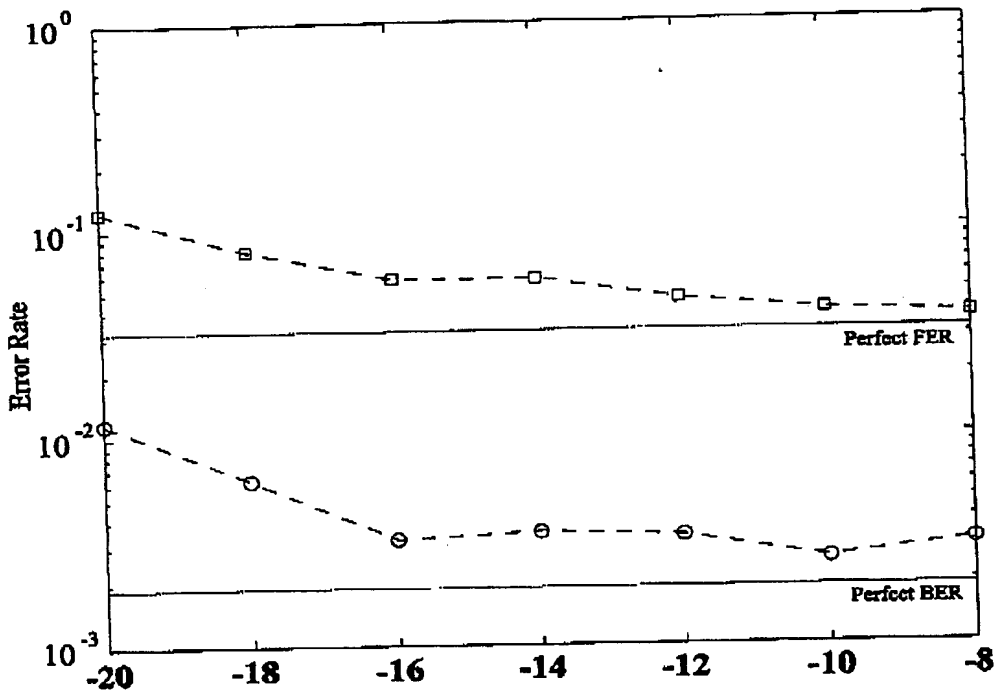


Figure 14

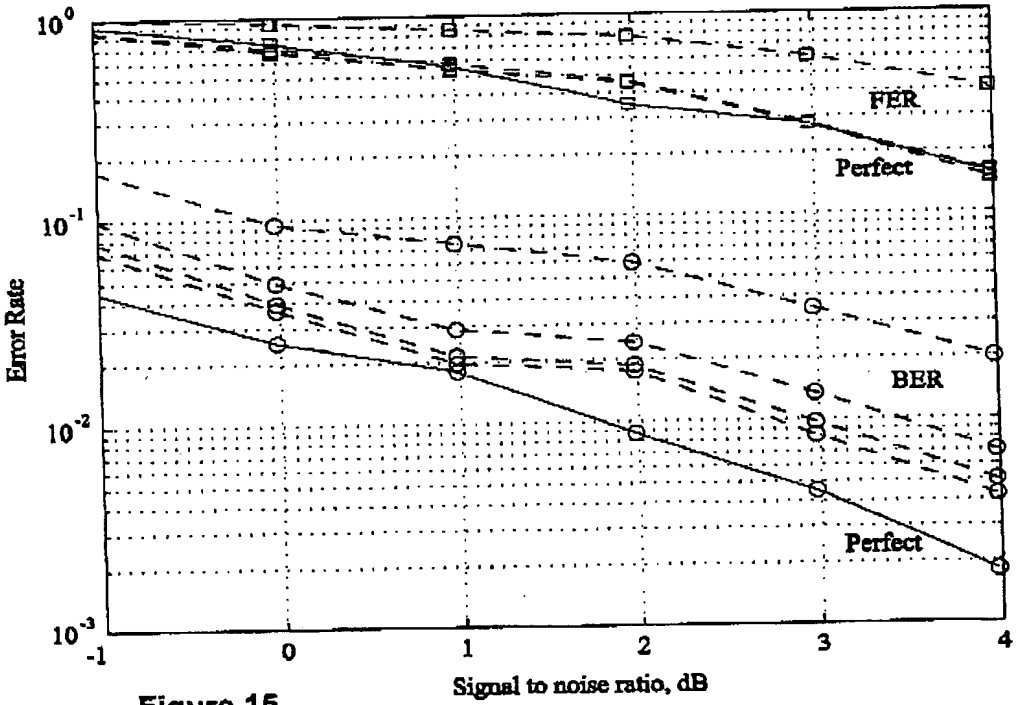


Figure 15

Constraint length K	Generators in octal	
3	5	7
4	15	17
5	23	35
6	53	75
7	113	171
8	247	371
9	561	753
10	1,167	1,545
11	2,335	3,661
12	4,335	5,723
13	10,533	17,661
14	21,675	27,123

Table 1

STC-Algorithm (N_T:N_R)	E_b/N_o dB for 10% FER	Spectral Efficiency (bps/Hz)	E_S/N_o (SNR) dB for 10% FER
Benchmark			
1:1	11.0	1.0	11.0
1:2	4.5	1.0	4.5
1:4	-0.5	1.0	-0.5
STTD (STBC)			
2:1	7.2	1.0	7.2
2:2	2.2	1.0	2.2
STTC-32			
2:1	11.0	2.0	14.0
2:2	4.6	2.0	7.6
MC-STTC-256			
2:1	9.6	2.0	12.6
2:2	3.5	2.0	6.5
4:1	12.0	4.0	18.0
4:2	4.0	4.0	10.0
4:4	-1.5	4.0	4.5
BLAST			
uncoded 2:2	12.0	4.0	18.0
coded 2:2	7.1	2.0	10.1

Table 2

Notes:Notation N_T:N_R is used to denote numbers of antennas at each end of the link.

a) E_S denotes energy per transmitted STS
b) The benchmark is a 1/2-rate k=9 binary convolutional encoder,with output bits mapped to QPSK symbols. In a *static* 1:1 channel it achieves 10% FER for an E_b/N_o of 2.2dB and 1% BER for an E_b/N_o of 1.7dB.
c) The benchmark 1:4 number is approximate, as it has been extrapolated from results at a lower FER
d) 'STTD' is a concatenation of the benchmark encoder with the STTD block code
e) 'STTC-32' is the Tarokh STTC with 32 states, and two information bits per STS
f) 'MC-STTC-256' is a concatenation of the benchmark scheme, a QPSK modulation mapper, and a demux mapper to the different transmit antennas, as described in. It thus has 2^{k-1}=256 states in the trellis, and a spectral efficiency which depends on the number of transmit antennas.
g) The variants of BLAST shown in the table use 'genie-aided' subtraction of the transmission from the stronger transmit antenna when detecting the transmission from the weaker.
h) The 'uncoded' BLAST case uses no error correction code (it is raw QPSK), hence it achieves a high spectral efficiency of 4 bps/Hz. The 'coded' case uses two separate 'benchmark' encoders, one for each antenna.

STC-Algorithm (N_T:N_R)	Spectral efficiency (bps/Hz)	Demodulator soft-metric (LLR) processing (MFLOPS)	Viterbi MLSE processing (MFLOPS)
Benchmark			
1:1	1	0.9	198.4
1:2	1	2.5	198.4
1:4	1	5.0	198.4
STTD (STBC)			
2:1	1	2.5	198.4
2:2	1	5.0	198.4
STTC-32			
2:1	2	8.7	12.4
2:2	2	17.4	12.4
MC-STTC-256			
2:1	2	8.7	99.2
2:2	2	17.4	99.2
4:1	4	69.4	168.6
4:2	4	138.9	168.6
4:4	4	277.8	168.6
8:8	8	71,198	1276.4
BLAST (coded)			
2:2	2	0.02+2.5+1.2=3.7	198.4
4:4	4	0.7+5.0+3.7=9.4	198.4
8:8	8	24.8+9.9+8.7=43.4	198.4

Table 3